Development of Cool Colored Roofing Materials: Collaboration between ISP Minerals, LBNL, and ORNL

Sponsored by the
California Energy Commission
(Project Manager: Chris Scruton)

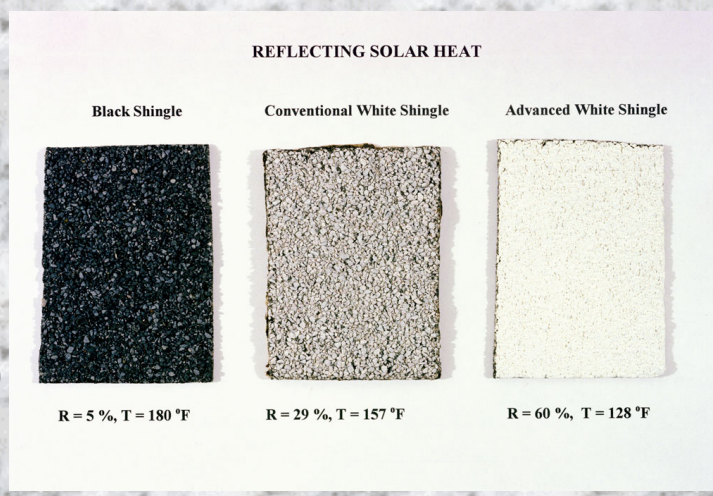
Presented by Ingo B. Joedicke
Chief Scientist, ISP Mineral Products

History of ISP/LBNL Collaboration

- Began in 1994
- ISP Resources:
  - Granule Manufacturing Expertise
  - Lab/Pilot Plant Facilities
  - Accelerated and Natural Weathering
  - Test Shingles (GAF)
- LBNL Resources:
  - Technical Expertise
  - Reflectivity Measurements
- Baseline: Characterize Existing ISP Product Line

Ultra-Bright White Development

- Various White Pigments Evaluated
- Pigment Loadings Optimized
- Multiple Coatings
- Finer Gradings
- A-707 Developed (TSR = 50)
- Ultra-Bright Pastel Colors
- Use to Increase Reflectivity of Light Blends



Example: Cool Light Brown Tile (photographed in sunlight)

standard: R=0.23

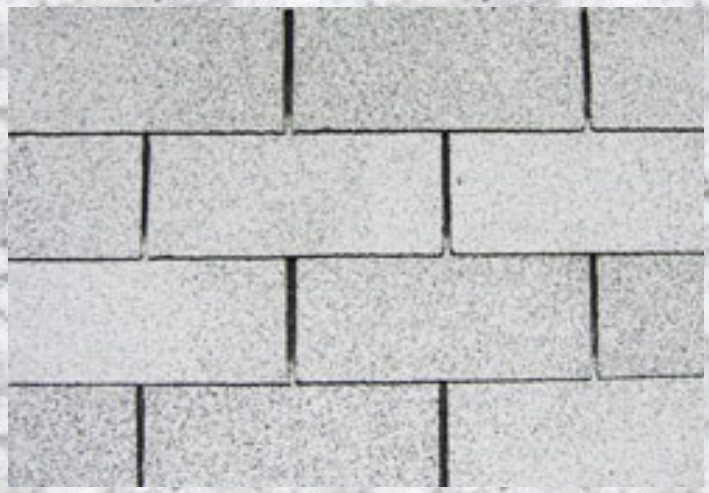
cool: R=0.28

R = solar reflectance

Example: Cool Gray Shingle (photographed in sunlight)

standard: R=0.27

cool: R=0.36



R = solar reflectance

Example: Cool Reddish Shingle (photographed in sunlight)

standard: R=0.28

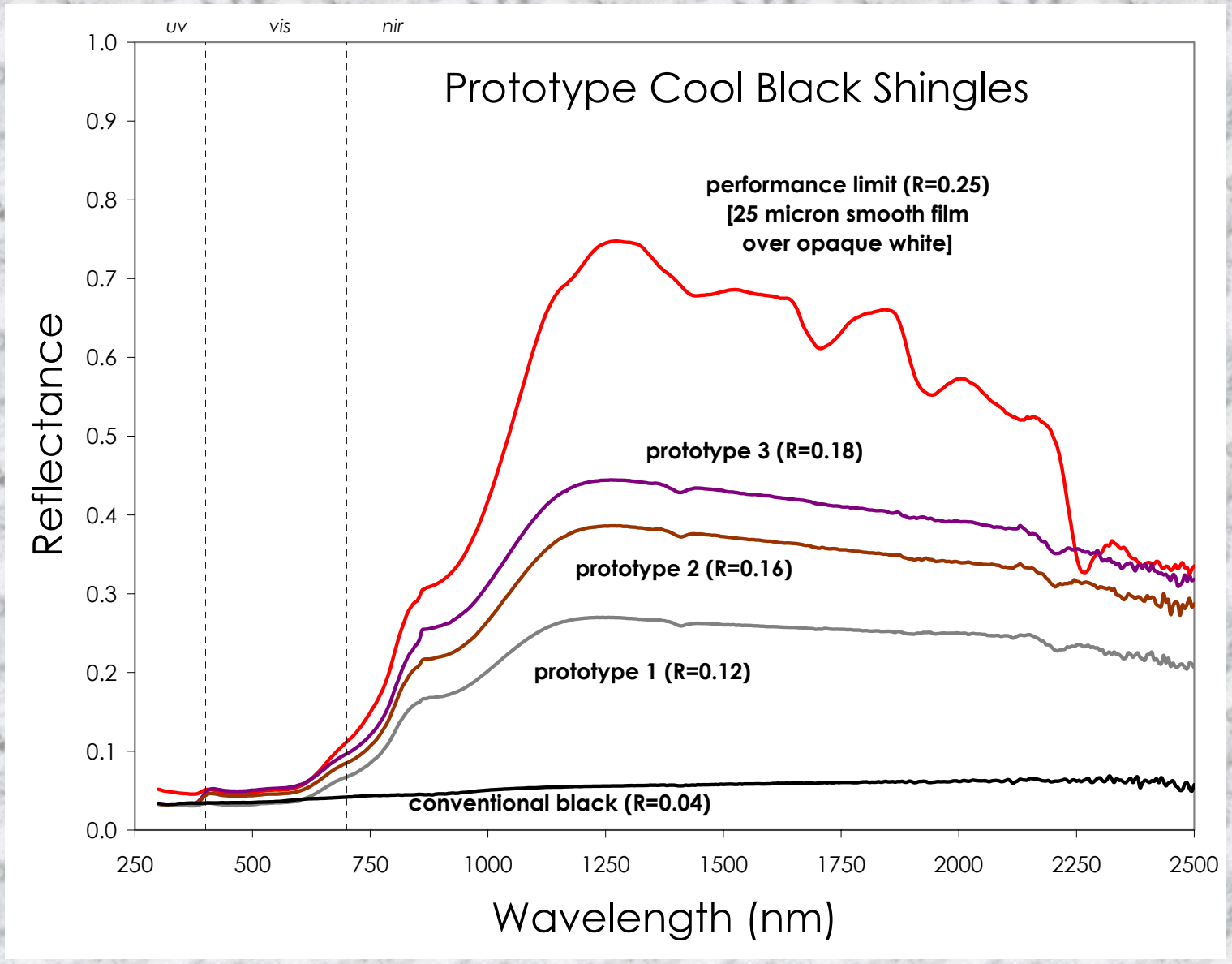
cool: R=0.37

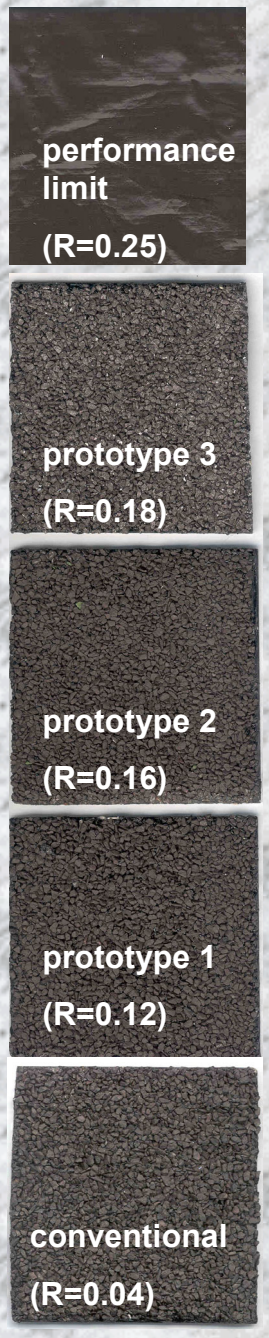
R = solar reflectance

Reflective Dark Granules

- Eliminate “Hot” Pigments
- Incorporate IR-Reflective Pigments
- Maximize Coating Coverage
  - High Pigment Loadings
  - Multiple Coatings
- Reflective Undercoats
  - e.g., Use with Perylene Pigments

Example: Development of Cool Black Shingles





Tasks Completed

- Developed Ultra-Bright Whites and Pastels
- Developed Reflective Dark Granule Prototypes
- Prepared 200 Experimental Roofing Granule Samples for LBNL Characterization
- Prepared Demonstration Shingles with Reflective Blends
- Provided Non-Proprietary Information about the Manufacture of Colored Granules
- Reviewed Reports Prepared by LBNL Staff and Provided Comments

Current and Future Work

- Continue Efforts to Increase Reflectivity and Reduce Costs
- Work with Project Team to Identify New Materials and Techniques
- Establish Test Roofs
- Expand to Large-Scale Demonstrations
- Review Pigment Database – Need to Expand
- Evaluate Coating Formulation Software
- Determine Weathering Benefits of Cool Roofing
- Need Tools to Accurately Measure Solar Reflectance of Manufactured Shingle